the 18-pounder, the howitzer, and the mortar, resembled noiseless jets of steam, projected, "so to speak, at our elbows." JOHN TYNDALL

Royal Institution, Nov. 17

CHARLES BLACKER VIGNOLES, F.R.S.

THIS celebrated engineer died on the 17th instant at Hythe, at the age of eighty-three years. Although he won his fame mainly as an engineer, yet his services to science were of considerable importance. Mr. Vignoles was descended from an ancient French family which had taken refuge in England after the repeal of the Edict of Nantes. His father, Capt. Vignoles, was an officer in the 43rd Regiment of the Line, and his mother was a daughter of Dr. Charles Hutton, the celebrated mathematician and professor at the Royal Military Academy, Woolwich. When young Vignoles was only twelve months old, his father lost his life at the storming of Pointe-à-Pierre, Guadaloupe, when Sir Charles Grey, the commander of the British forces, gave the former a commission in the army. Thus his career has been an unprecedentedly long one. His grandfather, Dr. Hutton, undertook his education, and the pupil certainly turned out a credit to his teacher. For a short time before the conclusion of the great war which ended in 1815, Vignoles served under the Duke of Wellington on the Continent, and after visiting America about 1822, he returned to England and threw himself enthusiastically into the engineering profession. The railway movement was just then gathering strength, and Vignoles was associated with some of the earliest efforts to establish lines in this country. After the Liverpool and Manchester Railway Bill was thrown out of Parliament in 1824, he was, in 1825, selected by Messrs. Rennie to take charge of the new surveys which the Liverpool Committee ordered. From this time forward Vignoles was ever in the van of the railway movement, and had the foresight to predict, amid some incredulity and ridicule, to what gigantic results it would lead. In 1826 he was employed by Messrs. Rennie to make surveys for a line from Nine Elms, Vauxhall, Dorking and Shoreham, to Brighton; and in 1834 he escorted M. Thiers over the railways which had been built under his superintendence. The great French Minister's dictum was, "I do not think railways are suited for France." In England, in Ireland, on the Continent, and in America, Mr. Vignoles took a prominent part in the carrying out of great railway and other engineering works. Probably one of his greatest works was the magnificent suspension bridge over the Dnieper at Kieff, commenced in 1848 and finished in 1853, at a cost of 432,000*l.* A fine model of this is now in the Crystal Palace.

Mr. Vignoles became a member of the Institution of Civil Engineers in 1827, and was elected President in 1870, when he gave a very able address on the progress of engineering. In 1842 he gave a series of remarkable lectures as Professor of Civil Engineering at London University College. In 1855 he was elected a Fellow of the Royal Society; he was also a Fellow of the Royal Astronomical Society, and was for long a regular attendant at its meetings. The Eclipse party of 1860 was to a great extent indebted to him for all the local arrangements, and its success was mainly due to his exertions. He was also Honorary Treasurer of the Expedition of 1870, was on board the *Psyche* when she struck, and was afterwards indefatigable in aiding the necessary arrangements. In the early part of its career he took an active part in the meetings of the British Association, contributing several papers to the Mechanical Section.

As might be expected, Mr. Vignoles was a man of great energy and strong physical constitution. On the Thursday before his death he attended the annual inspection, in his capacity of Lieutenant-Colonel, of the Engineers and Railway Volunteer Staff Corps. On the Saturday following he was struck with paralysis, and remained unconscious till his death on the following Wednesday. He was buried yesterday at the Brompton Cemetery.

THE GERMAN COMMISSION ON ARCTIC EXPLORATION

FURTHER details concerning the work of this Commission appear in a recent number of the *Karlsruher Zeitung*.

The Commission cannot recommend another Arctic expedition. The task of special geographical discovery, to whose solution previous expeditions have contributed, must, since the polar regions have been opened up at many points, give place to the task of exploring in detail the region of which we now have a general knowledge, and on the results thus attained to construct a sure basis for wider researches. "Without such an established basis, every new Arctic expedition might, according to the circumstances, accomplish more or less good results, but for this a considerable expenditure of public means would be the less advisable, that we may have a sure expectation, by following a different course from that hitherto pursued, of accomplishing, more slowly perhaps, but all the more surely, the exploration of the Arctic zone, and at the same time solve very important problems in science."

The Commission unanimously agree that the exploration of the Arctic region should be undertaken. The last part of the Report, without pretending to be complete, discusses very important questions in all departments of science, the solution of which is to be obtained by Arctic exploration. The majority of meteorological and hydrographic problems, many questions in the regions of terrestrial magnetism and physical astronomy, a number of questions in the department of natural science, in other words, the discovery of the laws of periodical phenomena and of the variations from these laws, cannot be accomplished by an Arctic expedition of the kind hitherto sent out. Such an expedition cannot remain for any length of time at a number of points, and can therefore furnish observations bearing only on time and place, which do not in the least enable us to conclude what would be the condition at another time.

It is otherwise with those scientific problems in which the establishment of facts is of importance, as in the majority of problems in natural history, and in many of the other regions of natural science and geography. For such problems an expedition of the usual kind would accomplish very valuable results. For the solution of other problems the establishment of observing stations is desirable, from which, through as long a period as possible, observations of periodical phenomena should be undertaken. But in order to be able to generalise the results, corresponding observations should be made from time to time at intermediate stations and in regions lying in the neighbourhood. A German expedition would thus erect observing stations on particular points, and then would make such arrangements that, according to the special circumstances of the stations, or to accomplish special scientific objects, exploring journeys could be made from the stations as a basis, by land and water, in sledges, ships, or boats. This combined system of fixed stations and exploring journeys would give us at least the prospect, by the minute exploration of any particular region in which it might be employed, of enriching our knowledge with a plentiful supply of facts.

The problems indicated by the Commission for Arctic exploration can only be fully solved by means of a connected system of stations and exploring journeys in the Arctic region, and thus the way be opened up to the hitherto entirely unexplored portion. Explorations must thus be carried on by the three great water approaches,

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which lead to the polar sea—between Greenland and Spitzbergen, between Spitzbergen and Novaya Zemlya, and through Behring Strait—and which have a physical connection, which is shown very distinctly in the isothermal curves. In this undertaking the co-operation of all States having an interest in these researches should be sought. Through the simultaneous action of different States a circle of observing points would be formed, which would sub-divide a common work having the same end in view, so that the combined labour of several nations would entail less sacrifice to each than has hitherto been the case. The Commission also recommends the above principles for the guidance of other nations, and thus an international alliance might be formed through which the highest scientific results would be attained. The Commission points out that one immediate result of the Second German Expedition is that the region between the west coast of Greenland and the east coast of Spitzbergen would be a suitable field for German research. As we have already stated (NATURE, vol. xiii., p. 33), they recommend a principal station to be established on the east coast of Greenland, with secondary stations on Jan Mayen Island and the west coast of Spitzbergen.

In the region indicated for observation, which can easily be reached from Central Europe, and whose exploration has for European States the greatest scientific and practical interest, German explorers have made a happy commencement, and established a claim for Germany to continue the work thus begun. The Commission urge Germany to set about at once fitting out an expedition for the occupation of the above region. They believe that if diligent preparations were made, the expedition might be ready to start in 1877. Finally, they recommend the appointment of a Scientific Commission to draw up full instructions for the guidance of the expedition in all departments.

THE FAUNA OF THE CASPIAN SEA

OSCAR GRIMM has given in Von Siebold and Kölliker's *Zeitschrift* a brief account of his exploring expedition to the Caspian Sea last year, which will make naturalists look expectantly for the completion of his descriptions. The character of the fauna of the Caspian has interest for the evolutionist in natural history, as well as for the geologist. It will afford evidence not only of modification of animal life, but also of successions of change in physical geography. Two months were spent at Baku, and one month on board a steamboat in dredging from Baku to Krassnowadsk, thence to the Balchan Bay on the east coast, by the island of Tscheleki, southwards to Astrabad, and thence by Enzili and Lenkoran to Baku. Dredging was carried on up to a depth of 150 fathoms, and an enormous quantity of specimens was obtained, including six new fishes (Gobius and Benthophilus), twenty species of Mollusca, including four species of Cardium, four of Adacna, and three of Dreyssena; thirty-five species of Crustacea, principally colossal forms of Gammaridæ; and twenty species of Vermes. The eastern coast adjoining the sandy steppes was almost destitute of marine life, owing to the quantity of sand blown into the sea. The western part of the sea gives depths of 517 fathoms, and has a very abundant fauna. At one haul of the dredge in 108 fathoms, not far from Baku, there were taken 350 specimens of Gammaridæ, 150 *Idothea entomon*, fifty colossal Mysis, six species of fishes, and many large Mollusca.

One hundred and twenty species in all were taken, of which eighty are new to science. Many more might be expected to reward dredgings in the deeper parts of the sea. Those already known fall into two classes: (1) those derived from still existing or already extinct species, or but slightly differing from species living in the nearest seas; and (2) those which are identical with those of other seas. The latter are species possessing special tenacity of life, such as *Sabellides octocirrata*, *Mysis relicta*, and *Idothea entomon*.

Relationship is shown between the Caspian fauna and the faunas of the Aral and Black Seas, and the Northern Ocean. But the connection with the latter is more recent than with the Black Sea, for *Phoca*, *Coregonus leucichthys*, and other forms, not existing in the Black Sea, are common to the Northern Ocean and the Caspian. The geographical changes which Dr. Grimm conceives to have brought about these results will be better understood, and their probability may be more easily criticised, when the complete account of the Caspian Fauna is published.

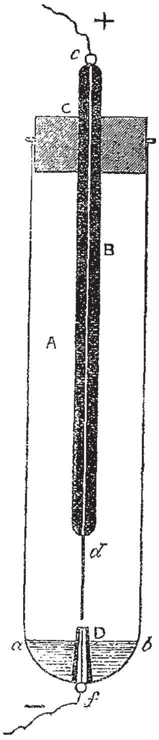
NEW FORM OF TUBE FOR OBSERVING THE SPECTRA OF SOLUTIONS*

WE have the honour of presenting to the Academy an eminently useful spectro-electric tube;† it realises, in fact, a certain number of advantages, which are as follows:—

1. Constancy of spark permitting prolonged observation of spectra. 2. Suppression of the meniscus, and consequently of the absorption which it produces by partly concealing the spark. 3. Electrodes enclosed in a special tube, which preserves the solution from contact with impurities. 4. Possibility of collecting entirely the substance examined. 5. Possibility of arranging a series of spectroscopic tubes, enclosing solutions of the various bodies, thus permitting rapid demonstrations and comparisons.

The closed tube A of eleven centimetres in height, and $1\frac{1}{2}$ centimetres in diameter, is traversed by a lower platinum electrode *f*; in the mouth of A is fixed a cork stopper C, pierced by an orifice through which passes a capillary tube B. B is traversed by a platinum wire *c d*, terminated at the upper end by a ring, and at the lower end by a point *d*, opposite *f*. *d* and *f* are the electrodes. The important part of the apparatus is a small capillary tube, slightly conical, one centimetre in height, moveable, and which covers the lower electrode *f*, topping it by $\frac{1}{2}$ millimetre.

To work the apparatus, pour into the tube A the solution to be examined, taking care that the electrode *f* and the tube D are only immersed to half their height. Let *a b* be the level of the liquid; capillary force determines the ascent as far as the point D, on which is formed an immovable drop which is vaporised when an induction current is put on by *c* and *f*. The observations may then continue a very long time without intermission, allowing the spectra to be observed and drawn with the greatest ease.



A, Tube into which the liquid to be analysed is poured. B, Capillary tube in which is fixed the platinum wire *c d*, which forms the upper electrode. C, Cork stopper closing the tube A; it supports B, and permits its being moved with little friction. D, Small capillary tube, slightly conical, covering the lower electrode *f*. *d*, Upper electrode. *f*, Lower electrode. *a b*, Level of liquid.

This very simple apparatus has rendered us so great service in the course of our investigations, that we cannot too strongly recommend its use to chemists engaged in spectral analysis. Never-

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* Paper read at the Paris Academy of Sciences, Oct. 26, by MM. Delachanal and Mermet. *Comptes Rendus*, t. lxxxi. No. 17, p. 726.

† See the description of the original apparatus in the "Annales de Chimie et de Physique," 5^e series, t. iii., 1874.

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